The Genus *Paragus* (Dipt.: Syrphidae) in the British Isles, including a Key to Known and Possible British Isles Species

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The hover-fly genus *Paragus* is cosmopolitan, seemingly absent only from the Neotropical (see Vockeroth, 1969), the islands of the Pacific Ocean (see Hull, 1937) and the polar regions. Problems of the identity of *Paragus* species are equally circum-global, since the genus contains groups of closely similar species and each group tends to be represented in more than one zoogeographic region, giving rise to much misinterpretation and synonymy. Stuckenberg (1954a) demonstrates this phenomenon very clearly in relation to the *Paragus serratus* group, starting out with three Oriental and two Afrotropical (this term is used here *sensu* Crosskey & White, 1977, in place of the confusing term "Ethiopian") species, one of which (*P. serratus*) was apparently shared, and ending up with four species in each region, none of them shared. At present, one of the British Isles species (*P. tibialis* Fal.) is supposedly found throughout the Holarctic and down into the Oriental region as far as Ceylon, in Australia and through the length and breadth of the Afrotropical (see Delfinado *et al.*, 1975; Stone *et al.*, 1965; Stuckenberg, 1954b). With time, this latter distribution pattern would seem likely to go the same way as that of the pre-Stuckenberg "*P. serratus*" — certainly the Afrotropical "*P. tibialis*" is not *P. tibialis* Fal., to judge from Stuckenberg's figure of the genitalia.

The *Paragus* species occurring in the Western part of the Palearctic have been chewed over by a variety of authors, but the result has been a progressive descent into chaos and confusion. The difficulties surrounding the correct determination of British Isles *Paragus* lessened somewhat with the appearance of Goeldin's (1971) paper and Pedersen's (1972) key to the Danish species, but in 1976 Goeldlin's masterly revision of the Western European species was published, providing a comprehensive account of all the species which might possibly occur here.

Stuckenberg (1954b) distinguished two subgenera of *Paragus*. As demonstrated by Goeldlin (1976), the European species all fall easily into one or other of these two sub-genera, and it would seem quite likely that eventually they will both be given full generic status. These generic sub-divisions have thus been followed in the present account. The synonymy of the three known British Isles species may be given as follows:

Paragus Lat. 1804
s. *Pandasyopthalmus* Stuck. 1954
haemorrhous Mg. 1822
sigillatus Curtis 1836
sigilatus Curtis 1836, variant spelling
tibialis Fal. auctt. partim. nec Verrall, 1901
trianguliferus Zett. 1838

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tibialis Fal. 1817
aeneus Mg. 1822
meridionalis Beck. 1921
numidus Macqt.
obscurus Mg. 1822
zonatus Mg. 1822
s. *Paragus* Stuck. 1954
albifrons (Fal. 1817)
bicolor (Fab. 1794) auctt. nec Verrall, 1901
lacerus Lw. 1840

Because Coe's (1953) key is now unuseable as a means of differentiating the *Paragus* species known to occur in the British Isles at present, I have constructed another key, based to a large extent on that in Goeldlin (1976). Seeing the confusion which has surrounded for so long the British Isles *Paragus* species, I have included in the key not only those species known there currently, but also others which may be expected to turn up. In addition to the species keyed out here, the following are known in continental Europe:

s. *Pandasyopthalmus*
coadunatus Rond.: Mediterranean islands and N. Africa

s. *Paragus*
absidatus Goeldl.: Alps and Pyrenees
cinctus Schin. & Egg.: France, Italy, Austria
flammeus Goeldl.: Switzerland
quadrifasciatus Mg.: central Europe to France
strigatus Mg.: Mediterranean basin

Recourse should be made to Goeldlin's (1976) key for the determination of continental European specimens.

Having seen no British Isles specimens of any of the predominantly orange *P. bicolor* group species, I am inclined to consider they are all absent here, but *P. bicolor* has been included in the accompanying key because it is a name that has been on the British lists. Of the two related species I have included, *P. finitimus* is in the key because E. Torp Pedersen has suggested to me (*pers. comm.*) that this species might be present in the British Isles and *P. punctulatus* is in the key because its continental distribution suggests its occurrence here is possible. *P. majoranae* is extremely similar to *P. albifrons* and occurs in N. France, so it too could turn up in the British Isles. A key to the known British Isles species only is being published elsewhere (Speight and Irwin, *in press*).

Key

1. Eyes with vertical stripes of white hair, alternating with either stripes of brown hair, or bare areas (♂ abdomen stout, see fig. 2e) ..... s. *Paragus* — 5
— eyes with a more or less uniformly distributed covering of white hair (♂ abdomen narrower and somewhat waisted, see figs. 2a, c) ..... s. *Pandasyopthalmus* — 2
2. ♂♂ 3
♀♀ 4

3. Sternites 2-4 of more or less equal length (and st. 5 hardly more developed than st. 6 or st. 7 (see fig. 2b); surstyli and parameres of about equal length (see figs. 3a-c); all-black or with parts of tergite 3 and or tip of abdomen reddish (usually all-black in British Isles specimens); body length (mm.) 4-5.5; wing length (mm.) 3.5-4; throughout the British Isles; May-September ..... *haemorrhous* Mg.

— sternite 4 no more than two-thirds the length of st. 3 (and st. 5 prominent) (see fig. 2d); surstyli only about half the length of the parameres (see figs. 3e-f); tergites from all-black to predominantly red (frequently only the genital capsule and central area of t. 3 reddish in British Isles specimens); body length (mm.) 4-5.5; wing length (mm.) 3-4; S. England (Hants./Dorset border) and S.W. Ireland (Co. Clare); July-August ..... *tibialis* Fal.

4. At present, females belonging to s. *Pandasyopthalmus* cannot be distinguished from each other, but it is worth noting here that they all have the scutellum entirely black, in contrast to most s. *Paragus* species.

5. Lower face greatly produced (see fig. 1b); tergite 8 with a pronounced longitudinal groove medianly; tergites predominantly red; N. Europe and mountain ranges S. to the Pyrenees ..... (*punctulatus* Zett.)

— lower face hardly produced, in outline more or less parallel with eye margin (see figs. 1c-f) 6

6. Lateral margins of all tergites black (abdomen all, or nearly all, black, at most with a median, orange triangular mark on t. 2 and a narrow, anterior, orange band on t. 3) 7

— lateral margins of tergites 2 and 3 (at least) all or partly orange (t. 3 all orange or with anterior half orange) 8

7. Tergites 2-4 with very distinct, but narrow, transverse bands of silver dusting (beneath the over-lying bands of whitish hairs), widely broken along the mid-line and placed about half-way down each tergite (see fig. 2f); abdomen usually all-black; most of Europe into N. France ..... (*majoranae* Rond.)

— tergites normally entirely without transverse bands of silver dusting, though the bands of whitish hairs are present and traces of dusting may be discerned; abdomen often with orange marks on tergites 2 and 3; (rim of scutellum yellow, though yellow area sometimes reduced to a small, obscurely yellow spot); body length (mm.) ♂ 4-6, ♀ 5.5-6; wing length (mm.) ♂ 3.25-4, ♀ 4-5.5; S. England from Devon to Sussex; no recent records; May-August ..... *albifrons* (Fal.)

8. ♂♂ 9

— ♀♀ 10

9. At least tergite 4 with a pair of distinct, but narrow, transverse bands of silver dusting, located in the hind third of the tergite (see fig. 2g), in addition to the general covering of short white and black hairs; Medi-

terranean basin through to Persia ..... (*bicolor* (Fab.))

— tergites without bands of silver dusting but with a general covering of short hairs (reddish anteriorly on each tergite, black posteriorly on each tergite); Scandinavia, Holland (?) and Switzerland ..... (*finitimus* Goeldl.)

'0 — tergite 7 with a shallow, median, longitudinal depression ..... (*finitimus* Goeldl.)

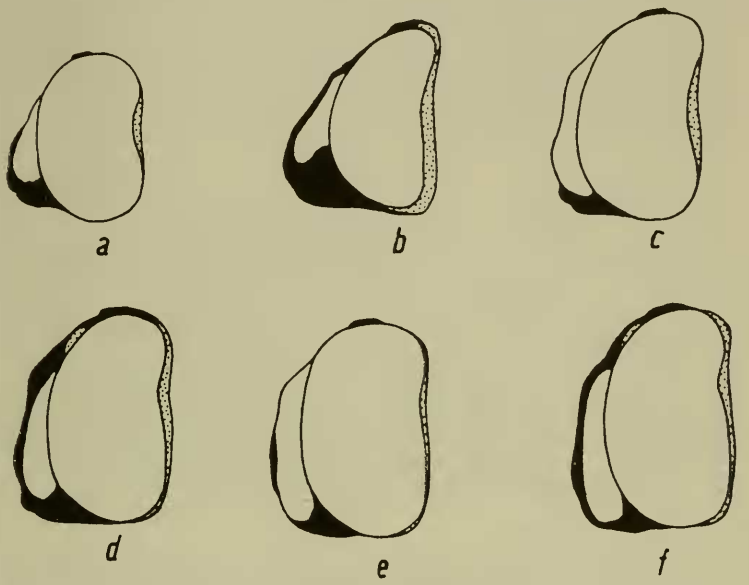

Fig. 1, Heads, side view: (a) *P. haemorrhous* ♂; (b) *P. punctulatus* ♀; (c) *P. albifrons* ♂; (d) *P. albifrons* ♀; (e) *P. bicolor* ♂; (f) *P. bicolor* ♀. Areas of obvious dusting are stippled; (a) and (c-f) are all drawn to the same scale; (b) has been redrawn from Goeldlin (1976).

10. Tergite 7 with a transverse, annular ridge ..... (*bicolor* (Fab.))

Notes on British Isles species

P. albifrons (Fal.)

This is the *P. bicolor* of Verrall, Collin and Coe (I have examined British specimens labelled as *"P. bicolor"* from the Verrall-Collin collection and the British Museum, and all were *P. albifrons*). It is the only known British Isles species belonging to the subgenus *Paragus*. Apart from the pale yellowish tip to the scutellum, *P. albifrons* is usually all-black, but may bear orange marks on tergites 2 and 3. In the field it is indistinguishable from *P. majoranae*, a species reinstated by Goeldlin (1976). A larger, more secretive species, of damper, more heavily vegetated sites than the others occurring in the British Isles, *P. albifrons* flies quite low among tall grasses and possibly flies for a shorter time each day than the others. It is probably more likely to be recorded from sweep-net activity than from direct collecting and can also be collected using

a malaise trap. The aphidophagous larvae have been described and figured by Goeldlin (1974).

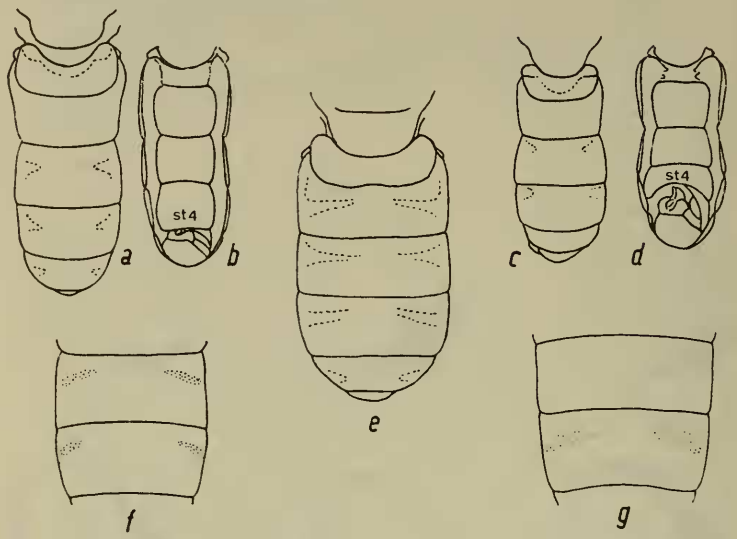

Fig. 2, ♂ Abdomens, from above and below: (a, b) *P. haemorrhous* (large and small specimens); (c, d) *P. tibialis*; (e) *P. albifrons*; (f) *P. majoranae*, tergites 3 and 4; (g) *P. bicolor*, tergites 3 and 4. Dotted lines in (a, c and e) outline depressions; stippled areas in (f, g) represent bars of dusting; st4=4th sternite; all drawn to same scale.

P. haemorrhous Mg.

Goeldlin's (1976) revision demonstrates that four species (one of them new to science) had been until then confused under the name *P. tibialis*. One of these was *P. haemorrhous*. This is the *P. sigillatus* of Curtis, wrongly synonymised with *P. tibialis* by Verrall (1901). *P. tibialis* can be distinguished from the three related species on non-genitalic characters, but the main character used in identification of the latter three is the shape of the parameres. Dr. Goeldlin has kindly examined for me a number of British Isles specimens belonging to this group and determined them as *P. haemorrhous*. The paramere shape illustrated by Goeldlin (1976) as typical of *P. haemorrhous* is shown in fig. 3b. I have illustrated in figs. 3a and 3c other paramere shapes I have found in British Isles specimens of what I take to be *P. haemorrhous* (fig. 3a is drawn from a specimen determined as *P. haemorrhous* by Dr. Goeldlin), but the range of variation exhibited is rather greater than might have been expected. Perhaps there are additional W. European species of *Paragus* awaiting recognition and *P. haemorrhous* is polyphyletic? Alternatively, could it be that *P. abrogans*, at present known only from the Type, collected in Persia, occurs in the British Isles? The paramere shape shown in fig. 3c certainly corresponds with that of *P. abrogans* (fig. 3d) to some extent. For the moment, I am assuming that figs. 3a-c all represent variants of paramere shape found in

P. haemorrhous. The fourth W. Palaearctic species in the *P. tibialis* group, *P. coadunatus,* has highly distinctive parameres (see Goeldlin, 1976).

As recognised here, *P. haemorrhous* is found in the British Isles in a wide range of open habitats, from sand-dunes to boggy moorland. The larvae are evidently aphidophagous and have been described and figured by Goeldlin (1974). The extent of pale markings on the legs and face of the adult varies quite markedly, as does overall body-shape and size, especially in the female (assuming ♀ specimens collected outside the known range of *P. tibialis* in the British Isles can be regarded as belonging to *P. haemorrhous*!). The adult flies may be found at low-growing flowers, such as *Potentilla erecta.* Generally they fly close to the ground, in a manner reminiscent of Pipunculids.

P. tibialis Fal.

The known distribution of this hover-fly in the British Isles is anomalous, implying as it does that the species is confined to two small areas, widely separated and of very different character. The English specimens, collected by Harwood, Wainwright and Yerbury, are from sandy heathland. The Irish specimens, collected by Coe and Irwin, are from low-lying limestone pavement in the Burren of Co. Clare. *P. haemorrhous* may occur in the same localities and

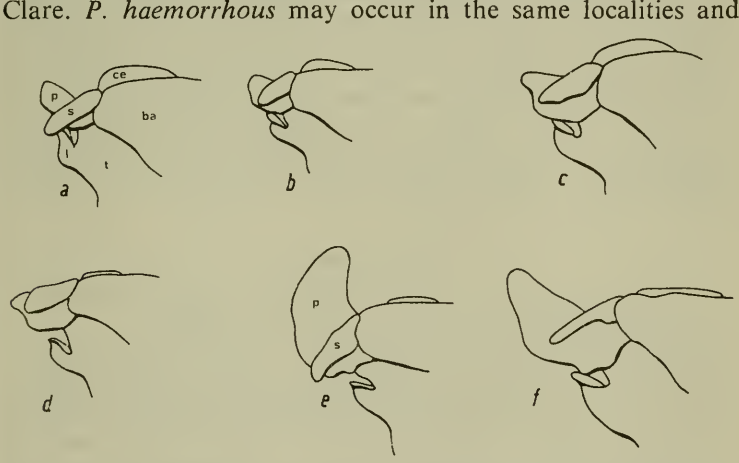

Fig. 3, Terminal parts of ♂ genitalia, side view: (a-c) *P. haemorrhous*; (d) *P. coadunatus*; (e, f) *P. tibialis.* ba=basale; ce=cerci; l=lingula; p=paramere; s=surstylus; t=theca; (a, c, f) drawn to same scale; (b, d, e) redrawn from Goeldlin (1976).

at the same time — two Harwood specimens I examined, mounted on the same piece of polyporus, were one of each species. In continental Europe it is a frequent occurrence to find *P. haemorrhous* and *P. tibialis* together. One of the Burren specimens (collected by Coe and in the collections of the British Museum, London) has parameres sufficiently different in shape from those of other *P. tibialis* I have examined (which all look very like the illustration of this

species given by Goeldlin, 1976, as in fig. 3e) to be possibly regarded as belonging to a specimen of some other species (fig. 3f). However, seeing that definite *P. tibialis* have been found in the Burren, and the strange-looking parameres of the Coe specimen are much closer in shape to those of typical *P. tibialis* than to the parameres of other *P. tibialis* group species, I think it possible that the Coe specimen is either aberrant or perhaps damaged, rather than something other than *P. tibialis* (the shape of st. 4 is in this specimen like that of typical *P. tibialis*).

Continental *P. tibialis* usually have the abdomen marked with red to some extent, but in the British Isles specimens I have seen (less than 20 in all) only the genital capsule and the very tip of the abdomen tend to be reddish. Body size and abdominal shape vary as much in this species as in *P. haemorrhous*, and include the shape variants found in *P. haemorrhous*.

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More about Francis Hemming's Entomological Diaries. — Since my note (**89**: 81-82) about the location of the late Captain Hemming's extensive entomological diaries (from 1921) in the Michigan State University Library, I have received a number of letters, both critical and thoughtful, about the ethics of removal of this very significant research material from England. The question of the alienation of manuscripts is an important one, which has been raised upon a number of occasions, and it ought to be answered in a serious manner.

At the time of the sale I ascertained that the dealer then responsible for the disposal of Hemming's records acted in a most responsible manner, offering them to several obvious British repositories at an extremely reasonable price. These offers were declined, and the dealer acted ethically in selling the diaries to one of the major American entomological libraries, rather than to a collection more convenient in location to British and European investigators. I was then a member of the faculty at Michigan State, and an advisor for entomological purchases, and did not hesitate to recommend acceptance of the offer. The presence of manuscript material in a major international library is preferable to its loss or eventual sale into private hands; even in the latter case it is often inaccessible to scholars.

In fact, the final resolution was quite satisfactory, as the M.S.U. Library (East Lansing, Michigan, U.S.A.) has adequate photoreproduction facilities, as well as free access in its rare book and manuscript reading room for consultation of Hemming's records in concert with other extensive entomological holdings. For those who still object, I offer several observations. Numerous major libraries own manuscript materials of interest to investigators in other countries, and are usually able to provide photocopies. This has become a worldwide scholarly commonplace. If a dealer is conscientious enough to try to place manuscripts in the most appropriate repositories (which he really need not do), he should be commended for his act, and upon their refusal the most worthy thing he *can* do is place the materials in another leading repository. Many of us can testify to the unpleasant alternative of seeking (and often being denied) access to manuscripts in personal hands. — Dr. R. S. Wilkinson, The American Museum of Natural History, New York City, New York 10024.